

Sanctuary Ecologically Significant Area (SESA)

SESA 8: Offshore Monterey Peninsula

Description

SESA 8 covers a mix of hard (33%) and soft bottom in outer shelf, shelf break, and slope habitats (111-1,706 m) off of the Monterey Peninsula. This SESA is westward of the Portuguese Ledge State Marine Conservation Area (SMCA) and includes a part of Monterey Canyon known as the San Gregorio meander. This SESA has the 4th highest habitat diversity (index = 5.32) and intermediate habitat richness (7 habitats). Surveys to characterize benthic habitats and communities have occurred over on the shelf (using camera sled and submersibles) and in canyon habitats (using ROV). There are hundreds of records of structure-forming invertebrates – crinoids, soft corals and gorgonians, sponges, stony corals, brachiopods, chemosynthetic communities and black corals – from ROV surveys. Other types of research in the SESA include benthic and mid-water trawl surveys, oceanographic monitoring, and seabird and mammals surveys. The water over this SESA is highly productive, a hotspot for krill, and a foraging hotspot for leatherback sea turtle, Ashy Storm-Petrel, Sooty Shearwater, and marine mammals (e.g., Dall’s porpoise, dolphins, sea lions, blue whale, humpback whale). This SESA is located within MBNMS, and research activities may require a permit (http://montereybay.noaa.gov/resourcepro/permit/permits_need.html).

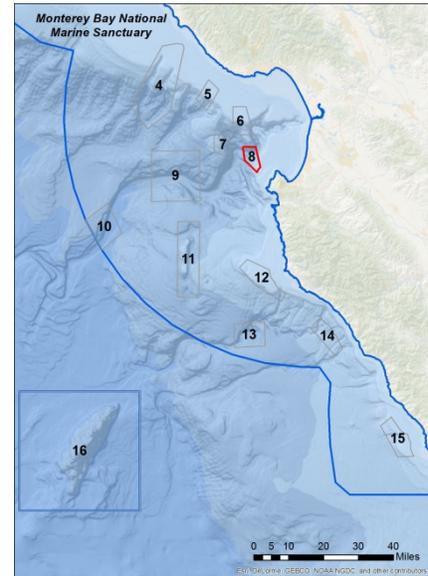


Figure 1. The location of SESA 8 and twelve additional SESAs in Monterey Bay National Marine Sanctuary. Credit: Chad King/MBNMS.

Resource Management Issues

SESA 8 has been heavily used as commercial fishing grounds. Fishing methods with footprints include bottom trawling, bottom longline, pot/trap, and hook-and-line gear. The area also contains demersal fishes conservation area.

- Adjacent to State MPA: Portuguese Ledge SMCA
- Commercial benthic fixed gear
- Rockfish Conservation Area (trawl)
- Essential Fish Habitat (EFH) Conservation Area
- Recreational fishing
- Wildlife viewing
- Lost fishing gear recovered
- Leatherback sea turtle critical habitat

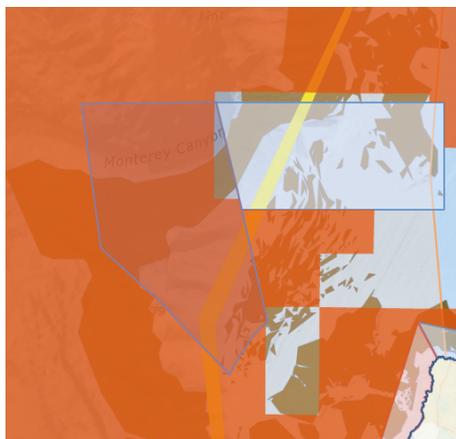


Figure 2. Close-up map of SESA 8. Grey border=SESA boundary; yellow=Rockfish Conservation Area; light orange border=EFH Conservation Area; light blue=State MPA; orange=commercial benthic fixed gear dominant use. Source: SESAs Interactive Map, <http://sanctuarymonitoring.org/maps/sesa/>.

Living Marine Resources & Uses

Table 1. Species known to occur within SESA 8: Offshore Monterey Peninsula.

Invertebrates	<ul style="list-style-type: none"> -sponges† (Porifera), e.g., <i>Asbestopluma</i> sp.; also flat, foliose, and barrel sponges -anemones (Actiniaria), e.g. <i>Metridium farcimen</i>, <i>Stomphia coccinea</i> -black corals† (Antipatharia) -stony corals† (Scleractinia), e.g., <i>Caryophyllina</i> sp. -soft corals† (Alcyonacea), e.g., <i>Anthomastus ritteri</i>; gorgonians, e.g., <i>Swiftia</i> sp., <i>Paragorgia</i> sp. -sea pens† (Pennatulacea), e.g., <i>Umbellula lindahli</i>, <i>Subselliflorae</i> -octopi (Cephalopoda) -California spot prawn (<i>Pandalus platyceros</i>) -brachiopods† (Brachiopoda), e.g., <i>Laqueus californicus</i> -sea lilies (Crinoidea), e.g., <i>Florometra serratissima</i> -sea stars (Asteroidea), e.g., <i>Mediaster aequalis</i> -brittle stars (Ophiuroidea) <p>(CSUMB/MBNMS videos and stills; Graiff 2008; MBARI VARS imagery)</p>
Fishes	<ul style="list-style-type: none"> -skates (Rajidae) -rockfishes (Scorpaenidae), e.g., Pygmy, Cowcod⁴, Halfbanded -Lingcod (<i>Ophiodon elongatus</i>) -Pink Seaperch (<i>Zalemibus rosaceus</i>) <p>(CSUMB/MBNMS videos and stills; MBARI VARS imagery)</p>
Marine birds	<ul style="list-style-type: none"> -Pacific Loon (<i>Gavia pacifica</i>) -Black-footed Albatross³ (<i>Phoebastria nigripes</i>) -Northern Fulmar (<i>Fulmarus glacialis</i>) -Buller's Shearwater (<i>Puffinus bulleri</i>), Pink-footed Shearwater³ (<i>P. creatopus</i>), Sooty Shearwater (<i>P. griseus</i>) -Ashy Storm-Petrel³ (<i>Oceanodroma homochroa</i>) -California Brown Pelican (<i>Pelecanus occidentalis californicus</i>) -Red-necked Phalarope (<i>Phalaropus lobatus</i>), Red Phalarope (<i>P. fulcarius</i>) -California Gull (<i>Larus californicus</i>), Heermann's Gull (<i>L. heermanni</i>), Western Gull (<i>L. occidentalis</i>) -Black-legged Kittiwake (<i>Rissa tridactyla</i>) -Common Murre (<i>Uria aalge</i>) -Cassin's Auklet³ (<i>Ptychoramphus aleuticus</i>) -Rhinoceros Auklet (<i>Cerorhina monocerata</i>) -Clark's Grebe (<i>Aechmophorus clarkia</i>), Western Grebe (<i>A. occidentalis</i>) <p>(Ainley et al. 2012)</p>

Marine mammals	-blue whale ¹ (<i>Balaenoptera musculus</i>) -humpback whale ¹ (<i>Megaptera novaeangliae</i>) -gray whale (<i>Eschrichtius robustus</i>) -dolphins (Odontoceti), e.g., Northern right-whale dolphin (<i>Lissodelphis borealis</i>), Risso's dolphin (<i>Grampus griseus</i>), Pacific white-sided dolphin (<i>Lagenorhynchus obliquidens</i>), Dall's porpoise (<i>Phocoenoides dalli</i>) -seals (Phocidae), e.g., harbor seal (<i>Phoca vitulina</i>), Northern elephant seal (<i>Mirounga angustirostris</i>) -sea lions (Otariinae), e.g., Stellar sea lion ² (<i>Eumetopias jubatus</i>), California sea lion (<i>Zalophus californianus</i>) (NOAA, 2003)
Marine reptiles	-leatherback sea turtle ¹ (<i>Dermochelys coriacea</i>) (NOAA, 2003)

Special Status Species: Endangered¹, Threatened², Birds of Conservation Concern³, Overfished⁴;
Biogenic habitat†

Diverse or productive communities:

- high primary productivity
- krill hotspot
- marine bird and mammal high diversity

Migration, breeding, or foraging areas:

- Dall's porpoise, dolphins, sea lions, blue whale and humpback whale (ESI, Environmental Sensitivity Index)
- Ashy Storm-Petrel (ESI)
- 10% in leatherback sea turtle principal foraging area, 100% in leatherback sea turtle NMFS critical habitat
- 100% in Sooty Shearwater (IBA, Important Bird Area)

Research

SIMoN projects:

Archival of Midwater and Benthic Survey Data at Moss Landing Marine Laboratories (1972-2013)

<http://sanctuariesimon.org/projects/100170/archival-of-midwater-and-benthic-survey-data-at-moss-landing-marine-laboratories>

Center for Integrated Marine Technologies: Wind to Whales (1997-2008)

<http://sanctuariesimon.org/projects/100155/center-for-integrated-marine-technologies%3a-wind-to-whales>

CSCAPE: Collaborative Survey of Cetacean Abundance and the Pelagic Ecosystem (2005-2007)

<http://sanctuariesimon.org/projects/100273/cscape%3a--collaborative-survey-of-cetacean-abundance-and-the-pelagic-ecosystem>

In-situ Measurements of Turbidity Currents in the Monterey Submarine Canyon (2002-03)

<http://sanctuariesimon.org/projects/100277/in-situ-measurements-of-turbidity-currents-in-the-monterey-submarine-canyon>

Marine Protected Area Monitoring and Shelf Characterization in Monterey Bay National Marine Sanctuary (2007-09)

http://www.sanctuariesimon.org/projects/project_info.php?projectId=100320

Monitoring whales by Cascadia Research Collective (1991-current)

<http://sanctuarymonitoring.org/projects/100152/monitoring-whales-by-cascadia-research-collective>

Seafloor Mapping in Monterey Bay, Cordell Bank, and Gulf of the Farallones National Marine Sanctuaries (2004-current)

<http://sanctuariesimon.org/projects/100237/seafloor-mapping-in-monterey-bay%2c-cordell-bank%2c-and-gulf-of-the-farallones-national-marine-sanctuaries->

Sea Turtle Restoration Project: Leatherback Watch Program (2010-current)

<http://sanctuarymonitoring.org/projects/100395/sea-turtle-restoration-project%3a-leatherback-watch-program->

Structure of Populations, Levels of Abundance and Status of Humpbacks (SPLASH) (2004-current)

<http://sanctuarymonitoring.org/projects/100224/structure-of-populations%2c-levels-of-abundance-and-status-of-humpbacks-%28splash%29>

Tagging of Pacific Predators (TOPP) (2000-current)

<http://sanctuarymonitoring.org/projects/100137/tagging-of-pacific-predators-%28topp%29>

Underwater Behavior of Large Whales Using Suction-cup Attached Tags (2000-current)

<http://sanctuarymonitoring.org/projects/100153/underwater-behavior-of-large-whales-using-suction-cup-attached-tags>

usSEABED: A USGS Pacific Coast Offshore Surficial Sediment Data and Mapping Project (2005-current)

<http://sanctuarymonitoring.org/projects/100247/usseabed%3a-a-usgs-pacific-coast-offshore-surficial-sediment-data-and-mapping-project>

Nearby:

Center for Integrated Marine Technologies: Harmful Algal Blooms (2002-08)

<http://sanctuariesimon.org/projects/100173/center-for-integrated-marine-technologies%3a-harmful-algal-blooms>

Center for Integrated Marine Technologies: Wind to Whales (1997-2008)

<http://sanctuariesimon.org/projects/100155/center-for-integrated-marine-technologies%3a-wind-to-whales>

Midwater Trawl Pre-recruit Survey (1983-current)

<http://sanctuarymonitoring.org/projects/100118/midwater-trawl-pre-recruit-survey>

Monitoring stations and/or data collection instruments:

- CIMT survey tracklines (historic)
- NMFS groundfish trawl stations (limited)
- Delta submersible, NMFS

MBNMS research:

- CTD profile (NOAA Ship Shimada, 2015)
- Mid-water fish trawl (NOAA Ship Shimada, 2015)

Science Needs & Research Questions

Bottom Trawling: Habitat and Species Recovery

http://sanctuaries.noaa.gov/science/assessment/pdfs/mbnms_extraction_trawling.pdf

- Which habitats are sensitive to bottom trawling?

Habitat Characterization of the Continental Shelf

http://sanctuaries.noaa.gov/science/assessment/pdfs/mbnms_characterization.pdf

- What are the distribution and abundance of organisms and habitats on the continental shelf?

Habitat Characterization of the Continental Slope

http://sanctuaries.noaa.gov/science/assessment/pdfs/mbnms_characterization_slope.pdf

- What are the distribution and abundance of organisms and habitats on the continental slope?
- How do corals and chemosynthetic communities on the continental slope provide biogenic habitat for other species?

Human Health - Harmful Algal Blooms

http://sanctuaries.noaa.gov/science/assessment/pdfs/mbnms_habs.pdf

- How do HABs affect local species populations?

Impacts on Whales from Human Uses

http://sanctuaries.noaa.gov/science/assessment/pdfs/mbnms_whale_science.pdf

- What are the spatial and temporal patterns of habitat use of large whales throughout sanctuary waters (both inshore and offshore)?

Socioeconomics and the Human Dimension

http://sanctuaries.noaa.gov/science/assessment/pdfs/mbnms_socioeconomics.pdf

- How do we determine the overall impact of multiple human activities (some with negative and some with positive influence) on Sanctuary resources?

Water Quality Integrated Analyses

http://sanctuaries.noaa.gov/science/assessment/pdfs/mbnms_water_quality.pdf

- Determine and implement the necessary monitoring to assess the condition of water quality in the Sanctuary.

SESAs Interactive Map: <http://sanctuariesimon.org/maps/sesa>

Publically Available Imagery

- CSUMB/MBNMS camera sled and ROV (<http://sep.csUMB.edu/ifame/scid/>)
- MBARI ROV: Video Annotation and Reference System (<http://www.mbari.org/products/research-software/video-annotation-and-reference-system-vars/>)



Figure 3. Lingcod (*Ophiodon elongatus*).

Credit: IfAME/CSUMB/MBNMS (<http://sep.csUMB.edu/ifame/scid/>).

SESA Data Layers

Table 2. The 13 SESAs of the MBNMS are comprised of a variety of biological and environmental characteristics that describe unique pelagic and benthic deep sea communities. Listed are a subset of these qualities which include habitat diversity (Shannon-Wiener diversity index); hard substrate area coverage (%); the most common type of habitat; the presence and abundances of corals and sponges, demersal fishes, and marine birds; and the area coverage (%) of upwelling zone within each SESA. Sources: Draft MBNMS report in preparation; SESAs Interactive Map, <http://sanctuarymonitoring.org/maps/sesa/>.

SESA	Habitat diversity (H')	Hard substrate (%)	Primary habitat	Corals & sponges	Demersal fishes	Marine birds	Upwelling zone (%)
4	5.43	8%	Slope 2 soft canyon	yes-high	yes-high	yes-high	yes-50%
5	6.13	19%	Slope 1 Soft Canyon	yes-high	yes-med	yes-med	yes-100%
6	6.62	13%	Shelf Break soft	yes-high	yes-low	yes-med	no
7	3.52	9%	Slope 2 soft canyon	yes-med	yes-high	yes-med	no
8	5.32	33%	Slope 2 soft canyon	yes-med	yes-med	yes-high	no
9	2.34	5%	Slope 2 soft canyon	yes-high	yes-high	yes-low	no
10	3.23	1%	Rise soft canyon	yes-med	not sampled	yes-low	no
11	1.56	16%	Slope 2 soft	yes-med	yes-high	yes-low	no
12	4.17	32%	Shelf hard	yes-med	yes-high	yes-med	yes-50%
13	2.00	0%	Slope 2 soft	yes-low	not sampled	yes-low	no
14	2.41	0%	Slope 1 Soft	yes-med	yes-high	yes-med	yes-50%
15	5.31	18%	Shelf Break soft	yes-med	yes-med	yes-med	yes-25%
16	3.12	73%	Slope 2 hard	yes-high	yes-high	yes-low	no

Selected Publications

- Aiken E, Baruch N, Basset M, Carlson R, Cuzick M, et al., Lindholm J. 2013. Characterization of Demersal Fish Assemblages Within Seven Sanctuary Ecologically Significant Areas in the MBNMS. Poster presentation at Sanctuary Currents Symposium, Seaside, CA. Available at: <http://montereybay.noaa.gov/research/techreports/trmsci4702013.html>
- Aiken E, Esgro M, Knight A, Lindholm J. 2014. Dirty Bottoms: ROV Observations of Marine Debris. Poster presentation at Sanctuary Currents Symposium, Seaside, CA. Available at: <http://montereybay.noaa.gov/research/techreports/traiken2014.html>
- Ainley D, Spear L, Casey J, Ford RG, Gill T, et al. 2012. Chapter 3: Biogeography of Marine Birds. A Biogeographic Assessment off North/Central California. Retrieved from Center for Coastal Monitoring and Assessment (NCCOS), National Ocean Service. <http://ccma.nos.noaa.gov/ecosystems/sanctuaries/california/html/birds/>
- Anderson TJ, Yoklavich MM. 2007. Multiscale Habitat Associations of Deepwater Demersal Fishes Off Central California. *Fishery Bulletin*, 105(2): 168-179. http://aquaticcommons.org/8889/1/anderson_t_fish_bull_2007.pdf
<http://montereybay.noaa.gov/research/techreports/tranderson2007.html>
- Benson SR, Forney KA, Harvey JT, Carretta JV, Dutton PH. 2007. Abundance, Distribution, and Habitat of Leatherback Turtles (*Dermochelys coriacea*) Off California, 1990– 2003. *Fishery Bulletin*, 105(3): 337-347. Available at: http://aquaticcommons.org/8876/1/benson_fish_bull_2007.pdf
<http://montereybay.noaa.gov/research/techreports/trbenson2007.html>
- Brown JA, EJ Burton, S De Beukelaer. 2013. The Natural Resources of Monterey Bay National Marine Sanctuary: A Focus on Federal Waters. Marine Sanctuaries Conservation Series ONMS-13-05. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries, Silver Spring, MD. 264 pp. Available at: <http://montereybay.noaa.gov/research/techreports/trbrown2013.html>
- California State University of Monterey Bay (CSUMB). 2005. *Shelf Characterization and Image Display (SCID)*. World Wide Web electronic publication. [<http://sep.csUMB.edu/ifame/scid/>]. Accessed [08/01/15].
- Eitrem SL, Roberto JA, Andrew JS. 2002. Seafloor Geology of the Monterey Bay Area Continental Shelf. *Marine Geology*, 181: 3–34.
- Graiff KW. 2008. The Abundance and Distribution of Megafaunal Marine Invertebrates in Relation to Fishing Intensity Off Central California. Doctoral dissertation, Washington State University. MBNMS Technical Report: <http://montereybay.noaa.gov/research/techreports/trgraiff2008.html>
- Greene HG, Yoklavich MM, Sullivan G, Cailliet M. 1994. A Geophysical Approach to Classifying Marine Benthic Habitats: Monterey Bay as a Model. In *Workshop Proceedings: Applications of Side-Scan Sonar and Laser-Line Systems in Fisheries Research*: 15-26.
- Greene HG, Maher NM, Paull CK. 2002. Physiography of the Monterey Bay National Marine Sanctuary and Implications About Continental Margin Development. *Marine Geology*, 181(1-3): 55-82.
- Hall RA, Glenn SC. 2011. Internal Tides in Monterey Submarine Canyon. *Journal of Physical Oceanography*, 41(1): 186-204.
- Laidig TE, Kringsman LM, Yoklavich MM. 2013. Reactions of Fishes to Two Underwater Survey Tools, a Manned Submersible and a Remotely Operated Vehicle. *Fishery Bulletin*, 111(1): 54-67.
- Leeworthy VR, Jerome D, Schueler K. 2014. Economic Impact of the Commercial Fisheries on Local County Economies from Catch in All California National Marine Sanctuaries 2010, 2011 and 2012. Marine Sanctuaries Conservation Series ONMS-14-03. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries, Silver Spring, MD. 46pp. Available at: <http://montereybay.noaa.gov/research/techreports/trleeworthy2014.html>
- Meduna D, Rock SM, McEwen R. 2009. AUV Terrain Relative Navigation Using Coarse Maps. In *Proceedings of the 2009 Unmanned Untethered Submersible Technology Conference*.

Monterey Bay Aquarium Research Institute (MBARI). 2015. *Video Annotation and Reference System (VARS)*. World Wide Web electronic publication. [<http://www.mbari.org/vars/>, version 7/27/15]. Accessed [08/01/15].

Naehr TH, Eichhubl P, Orphan VJ, Hovland M, Paull CK, Ussler W, Greene HG, et al. 2007. Authigenic Carbonate Formation at Hydrocarbon Seeps in Continental Margin Sediments: A Comparative Study. *Deep Sea Research Part II: Topical Studies in Oceanography*, 54(11): 1268-1291.

Newton KM, Croll DA, Nevins HM, Benson SR, Harvey JT, Tershy BR. 2009. At-sea Mortality of Seabirds Based on Beachcast and Offshore Surveys. *Marine Ecology Progress Series*, 392: 295-305.
<http://montereybay.noaa.gov/research/techreports/trnewton2009.html>

NOAA National Centers for Coastal Ocean Science (NCCOS). 2003. A Biogeographic Assessment off North/Central California: To Support the Joint Management Plan Review for Cordell Bank, Gulf of the Farallones, and Monterey Bay National Marine Sanctuaries: Phase I - Marine Fishes, Birds and Mammals. Prepared by NCCOS's Biogeography Team in cooperation with the National Marine Sanctuary Program. Silver Spring, MD 145 pp.

Orange DL. 1999. Widespread Fluid Expulsion on a Translational Continental Margin: Mud Volcanoes, Fault Zones, Headless Canyons, and Organic-Rich Substrate in Monterey Bay, California. *Geological Society of America Bulletin*, 111(7): 992 -1009.

Paull CK, Caress DW, Ussler III W, Lundsten E, Meiner-Johnson M. 2011. High-Resolution Bathymetry of the Axial Channels within Monterey and Soquel Submarine Canyons, Offshore Central California. *Geosphere*, 7(5): 1077.

Stakes DS, Orange D, Paduan JB, Salmay KA, Maher N. 1999. Cold-seeps and Authigenic Carbonate Formation in Monterey Bay, California. *Marine Geology*, 159(1): 93-109.

Starr RM, Burton EJ, Greenley A, Lea RN, de Marignac J, Morris E, Yoklavich MM. 2005. Rocky Shelf Fish Surveys in the Monterey Bay National Marine Sanctuary. Poster presentation at the 2005 Sanctuary Currents Symposium, Seaside, CA.
<http://montereybay.noaa.gov/research/techreports/trstarr2005.html>

Starr RM, Yoklavich MM. 2008. Monitoring MPAs in deep water off central California: 2007 IMPACT submersible baseline survey. California Sea Grant College Program. MBNMS Technical Report:
<http://montereybay.noaa.gov/research/techreports/trstarr2008.html>

Watters DL, Yoklavich MM, Love MS, Schroeder DM. 2010. Assessing Marine Debris in Deep Seafloor Habitats off California. *Marine Pollution Bulletin*, 60(1), 131-138.

Nearby Studies:

Barry JP, Greene HG, Orange DL, Baxter CH, Robison BH, Kochevar RE, et al., McHugh CM. 1996. Biologic and Geologic Characteristics of Cold Seeps in Monterey Bay, California. *Deep Sea Research Part I: Oceanographic Research Papers*, 43(11): 1739-1762.

Barry JP, Kochevar RE, Baxter CH. 1997. The Influence of Pore-water Chemistry and Physiology on the Distribution of Vesicomid Clams at Cold Seeps in Monterey Bay: Implications for Patterns of Chemosynthetic Community Organization. *Limnology and Oceanography*, 42(2): 318-328.

Blaine JM. 2011. Population Dynamics and Spatial Distribution of Two Commercially Important Species of Sea Cucumber, *Parastichopus californicus* and *Parastichopus leukothele*, in Deep Central California Waters. M.S. Thesis, Washington State University. 1-46.

Harrold C, Light K, Lisin S. 1998. Organic Enrichment of Submarine-canyon and Continental-shelf Benthic Communities by Macroalgal Drift Imported from Nearshore Kelp Forests. *Limnology and Oceanography*, 43(4): 669-678.

Xu JP, Noble MA, Rosenfeld LK. 2004. In-situ Measurements of Velocity Structure Within Turbidity Currents. *Geophysical Research Letters*, 31(9).